



# FMI Sodankylä SMAP Core Test Site

Jouni Pulliainen, Timo Ryyppö, Kimmo Rautiainen  
Finnish Meteorological Institute, Arctic Research Centre

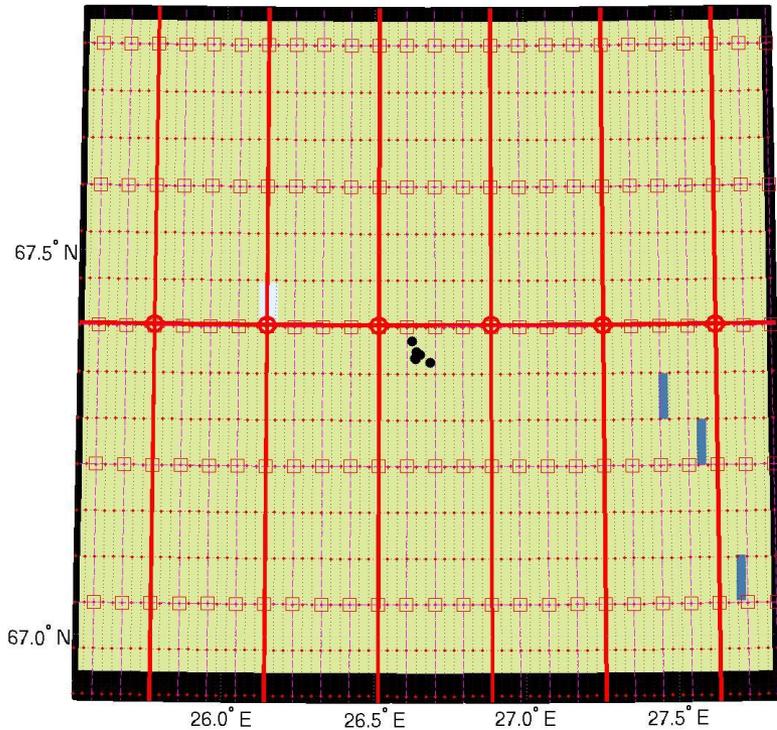
## Acronyms

NCEP CFSV2	–	National Centers for Environmental Prediction, Climate Forecast System
VIC	–	Variable Infiltration Capacity
VWC	–	Volumetric water content
HOBE	–	Hydrological OBsErvatory
CESBIO	–	Centre d'Etudes Spatiales de la BIOsphère

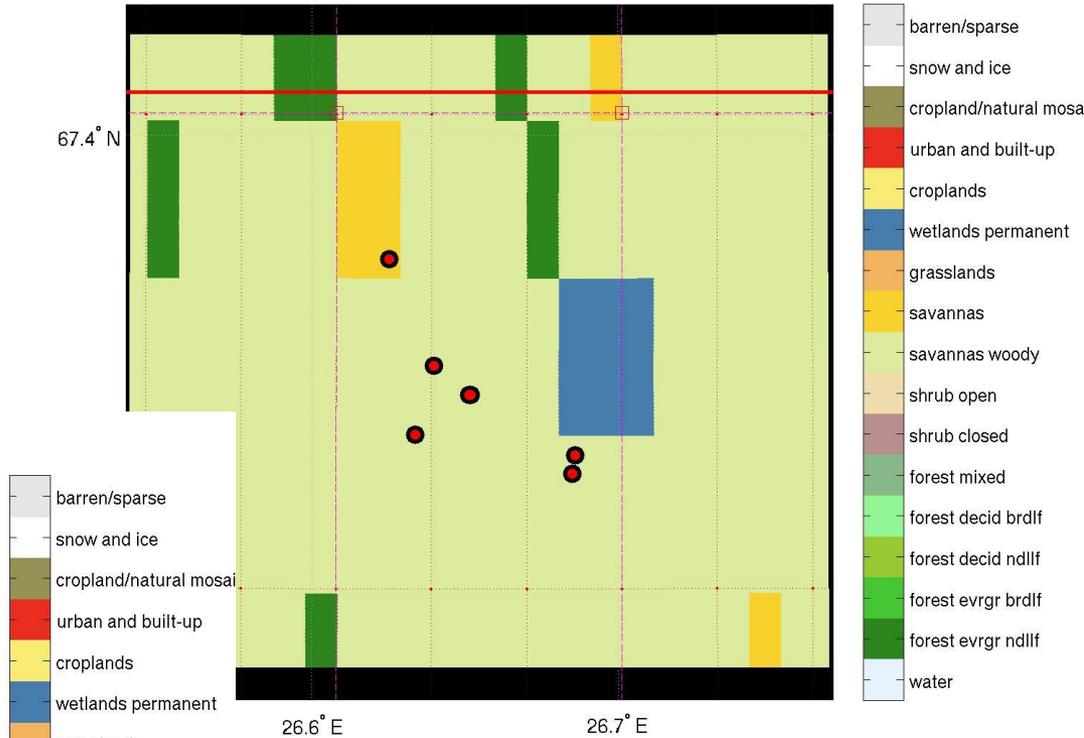


# Sodankylä station map

Sodankyla (1701)



17010301 (in Sodankyla)



- **Land cover map is highly inaccurate!**



Mixed / spruce forest, thicker organic layer



Pine forest, mineral soil



Saariselkä tundra site



Sparse forested wetland

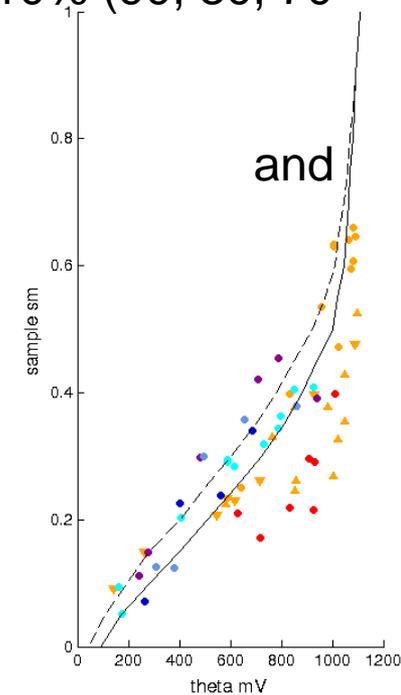
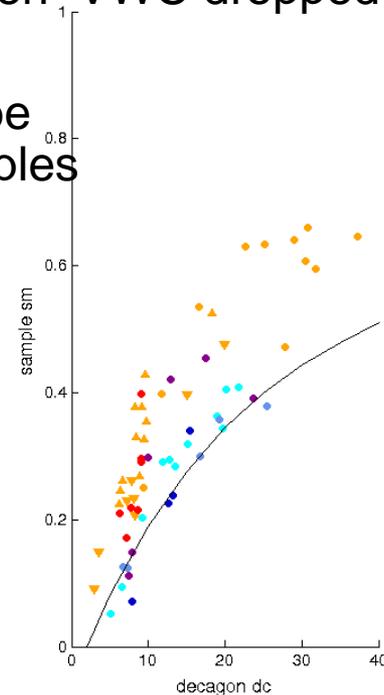


Open wetland



# Approach to calibration

- SM sensors: factory calibrated Decagon TE5
- Site specific validation for pine forest site (mineral soil), mixed/spruce forest site (thicker organic layer)
  - On Laboratory: Soil samples collected, moistened to saturation, measured in laboratory continuously with TE5 sensor, daily Theta probe measurements, gravimetric samples when VWC dropped 10% (90, 80, 70 ...) from the original/previous.
  - On each site: Comparison of Theta probe (manual) observations, gravimetric samples automatic measurements.
  - Co-operation with CESBIO and HOBE (Danish SMOS Validation site)

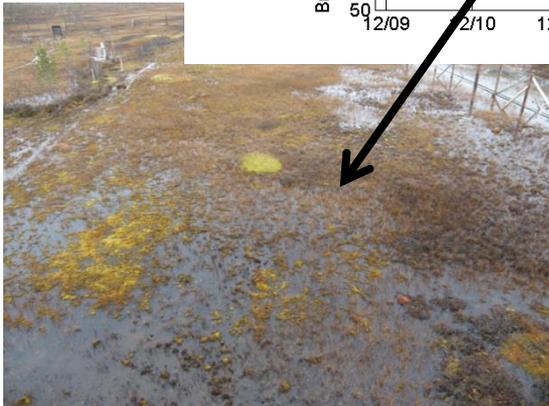
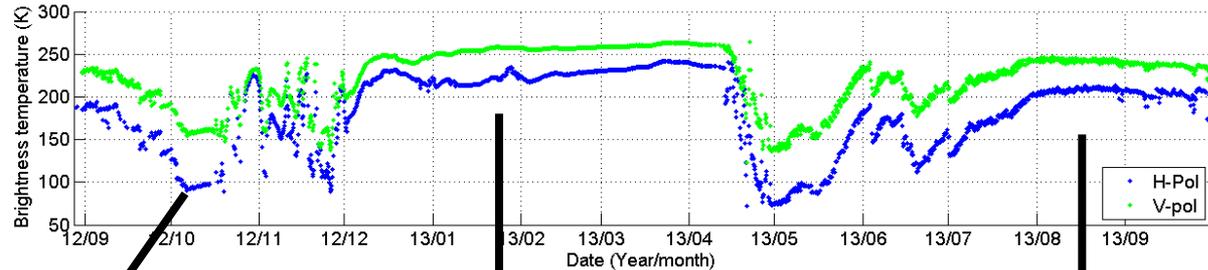




# Approach to representing the SMAP products

- Soil moisture: Top layer sensors at 5 cm depth assumed to represent the SMAP measurements.
  - Effect of water table height strong at wetlands; at extreme wet conditions wetlands as open water areas, end of summer thick vegetation layer.

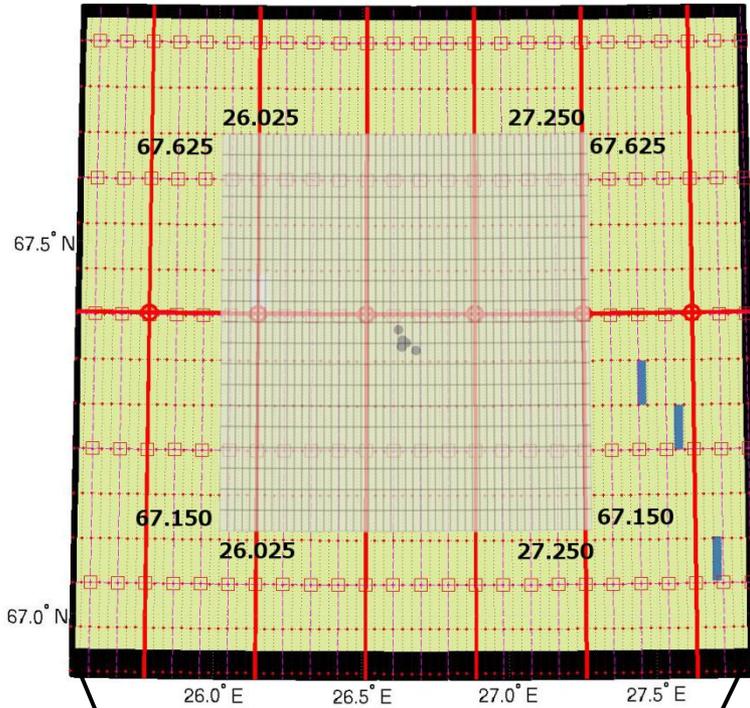
**ELBARA-II, L-band  
radiometer obs.  
In Sodankylä:**



- Freeze/thaw: Temperature and SM profile from test sites (5,10,20 cm)
  - Can be used for validation of correct threshold levels to active measurements

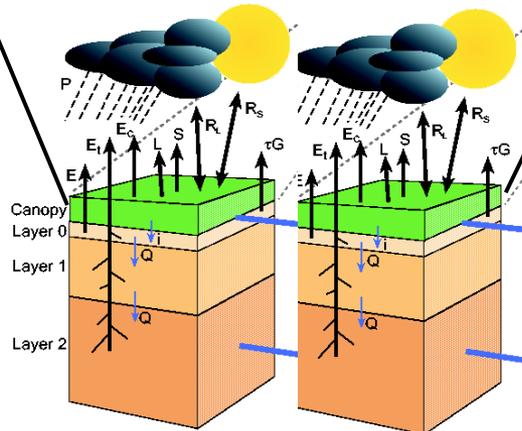


Sodankyla (1701)



# Up-scaling SMAP Products with Land Surface Models

- The Variable Infiltration Capacity (VIC) model (Univ. Washington, USA)
  - Physically based land surface atmosphere exchange simulation of moisture and energy
    - Top soil (0-10 cm) moisture conditions in different soil types and land cover
  - 0.025 degree grid cells / 6 hour time steps
    - Preliminary coverage: Sodankylä 1701
  - Possibility for limited global up-scaling efforts or selected other regions
    - Forcing: NCEP CFSv2 re-analysis data and / or meteorological data
    - Land cover and soil parameters derived from global data sets





# Pre-launch field campaigns

- Summer 2014 two additional tundra stations will be installed
  - Site specific sensor calibration for tundra measurements.
  - Scaling rehearsal for tundra site using all three stations
- Sodankylä area:
  - Spatial variability and scaling
  - Spatial distributed soil permittivity measurements
  - Effect of bogs to soil moisture retrieval